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REPORTS OF OBSERVATORIES.

THE LAWS OBSERVATORY OF THE UNIVERSITY OF MISSOURI, COLUMBIA, MISSOURI.

The work of the Department of Astronomy of the University of Missouri consists of instruction in the various branches of the science as presented to the students of the University, and in the prosecution of such observations as can be made satisfactorily with the equipment of the Laws Observatory.

The principal instrument of the observatory is a 7½-inch equatorial, constructed by Merz & Sons about 1848. The objective is of fair quality, although the glass entering into it is somewhat defective. The mounting is of the original Fraunhofer design, with the slight modification introduced by Merz, and, though inconvenient, and in some respects defective, the instrument is, nevertheless, serviceable for many kinds of observations. The driving-clock, fitted with a Fraunhofer governor, is of the type found upon all the Munich instruments of that period. Until recently the telescope has been supported by a wooden framework which stood upon a brick pier terminating two feet below the floor of the equatorial-room. The wooden support has been replaced by a cast-iron column, which gives the instrument a thoroughly stable foundation. The lower sections of the column were obtained from Warner & Swasey, and are a part of their standard 8-inch equatorial mounting. The pier-head casting was constructed from designs and patterns made in the shops of the University. The instrument is fitted with a micrometer of the Fraunhofer type and with an excellent modern micrometer by Saegmuller.

The telescope is, in a sense, an historic instrument, as will be seen from the following extract from the University of Missouri Catalogue for 1884-1885:—

> "This telescope was ordered in 1848 from the establishment of Merz & Mahler,* of Munich, for the use of Shelby College, Shelbyville, Kentucky. It was received at Shelbyville in November, 1850, and cost, when mounted, $4,000. It was mounted under the direction of Prof. JOSEPH WINLOCK, and used by him while he was a professor in that institution. After Prof. WINLOCK went to Cam-

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* The telescope bears the inscription: Merz u. Söhne in München.

bridge, Mass., he borrowed this telescope, and, in connection with Dr. B. A. GOULD, established there the Cloverdon Observatory. In LOOMIS's *Recent Progress of Astronomy,* the following statement is made respecting this instrument, which was then the fourth in magnitude in the United States:—

"'The great telescope belonging to Shelby College was loaned to Prof. JOSEPH WINLOCK, and was removed to Cambridge, Massachusetts, where temporary accommodations were provided for it, and this establishment is known by the name of Cloverdon Observatory.' . . . 'Numerous observations on comets, and on some of the newly-discovered planets, have been made with this telescope by Dr. B. A. GOULD and Prof. JOSEPH WINLOCK, some of which have been published in *Gould's Astronomical Journal.* This great telescope has recently been returned to Shelby College.'

"In 1869 Prof. WINLOCK, who was then Director of the Observatory of Harvard College, went with his assistants to Shelbyville, Kentucky, and there used this telescope in observing the total eclipse of the Sun, which occurred on the 7th of August of that year."

During the past year considerable additions to the equipment of the observatory have been made through various purchases. A Pickering stellar photometer by the Alvan Clark & Sons Corporation, and a disk photometer by Brashear have been obtained. The latter is to be used for testing purposes; the former, for systematic observations of variable stars. The Observatory has been re-wired for electrical connections, and a new and simplified switch-board has been introduced. Considerable quantities of minor apparatus, such as sextants, artificial horizons, testing instruments, batteries, etc., have also been acquired.

Since September, 1901, the time has been occupied mostly in a reorganization of the observatory and in the accomplishment of certain administrative details. The library has been increased through gift by about 600 books and pamphlets, and, through purchase, by seventy-seven volumes.

Since September, 1902, 53 observations of comets have been made. Of this number, 32 were of Comet *b* 1902, 5 were of Comet *d* 1902, and 16 of Comet *a* 1903. Thirty of the observations of Comet *b* 1902, together with an orbit based upon intervals of 26 and 28 days, have been published and distributed in Laws Observatory Bulletin No. 1.

F. H. SEARES,
Professor of Astronomy and Director of the Laws Observatory.

ALLEGHENY OBSERVATORY.

The present staff of the Observatory is constituted as follows: F. L. O. WADSWORTH, Director; FRANK K. BAILEY, Assistant; ALICE E. DAVIS, Secretary and Assistant. At present Mr. BAILEY's time is devoted almost exclusively to the maintenance of the time service; Miss DAVIS has been engaged in library and general correspondence work, and has also rendered very efficient service as a computer.

The new observatory building still remains unfinished, and a considerable part of the coming year must elapse before the books and instruments can be transferred to it from our present site.

Very little progress has likewise been made in getting ready the equipment of the new building. The only points of interest in this connection are the following:—

(1) The disks of the 30-inch refractor, which were ordered of Mantois in June, 1899, were received from him on February 19th of the present year. Both disks are beautifully clear and transparent, and, as far as can be determined by preliminary tests, of first-class optical quality. The constants of both the flint and crown glass have been accurately determined and carefully studied by Professor HASTINGS, who has submitted several alternative designs of optical construction. The final type has not, however, been definitely decided upon.

(2) *The Westinghouse Electrical Equipment.*—After careful consideration of the plans of electrical equipment and proposed research work of the electrical laboratories, Mr. WESTINGHOUSE most kindly and generously volunteered to practically double the amount of his original gift, in order to more fully provide for these purposes. As now provided, the generating plant will consist of two 37½-kilowatt dynamos, directly connected each with a 50 H. P. triple cylinder Westinghouse gas-engine. The dynamos will be specially built to give either direct or alternating currents. As D. C. machines they can be connected in multiple to give a current of 600 amperes at 125 volts, or in series to give a current of 300 amperes at 250 volts. As alternators they will furnish a corresponding current at a mean E. M. F. of 90 volts and 1,800 cycles per minute, which can be transformed by step-up transformers to any voltage desired for induction coil and high potential spark

discharge work, or by step-down transformers to furnish a low voltage current of several thousand amperes for electric furnace work. In this experimental work the low rate of alternation, while unsuitable for electric lighting, is in many cases a decided advantage.

In addition to these generators, the plant will also contain a rotary transformer of 5 K. W. capacity, which can be used to give alternating currents of a higher rate of frequency, *i. e.* 7,200 cycles per minute, if desired. This can be driven either directly from one of the main generators or from a storage battery. The final plans contemplate the installation of a storage battery of at least 100-kilowatt hours capacity, so that using both generators and storage battery in multiple, currents of at least 1,000 amperes at 100 volts, or 10,000 amperes at 10 volts, may be obtained for short intervals for experimental work. At present, however, this storage battery is not provided for.

With the generous assistance and active co-operation of two of the members of our Visiting Committee, funds were secured for the erection of the power-house during the latter part of the year. The building, which has been erected by Beunte & Martin, is now nearing completion. It is entirely of concrete, with Berea stone facings similar in general design to the main observatory building. At present only one story has been erected, the roof, which is flat and of heavy concrete construction, being on a level with the ground about the main building. The northern front faces on the proposed park road, and a flight of stone steps of plain but handsome design leads from the lower terrace level, along which the road runs, to the upper terrace level about the main building.

(3) The construction of the new clocks for the Observatory has been intentionally postponed until some experiments now in progress elsewhere have been completed, and until the new building is ready for their reception. There is no place at the present observatory where further experimental work on the various questions connected with the final design of these clocks can be advantageously carried on, and no place where they could be installed even if finished.

(4) The contract for the Keeler Memorial Telescope, both optical parts and mountings, was let to the John A. Brashear Company, January 24, 1902. The disks for the 30-inch specu-

lum and the 18-inch and 12-inch flats for the attached cœlostat and polar heliostat were received on March 26th, and have been roughed out and fined ready for the final polishing and figuring. The two observing floors for the instrument have been erected and the heavy cast-iron piers delivered at the observatory, but have not yet been placed in position. I regret to report that very little work has been done on the mounting itself, but this is now being pushed more rapidly.

(5) The principal optical parts of the Porter 10-inch grating spectroscope have been begun, but no work has been done on the mounting.

(6) The two small domes have been erected and wood-sheathed, but not yet covered with metal. The form of running gear originally designed for these domes was changed by the Observatory Committee after the contract for the steel work was let. This change in the former involved other changes in the latter, which have somewhat delayed the construction and erection of the domes, and which have prevented the carrying out of certain special features of the control and operation of the smaller dome that from the standpoint of the astronomer seemed most desirable. This is to be regretted, as experience has conclusively shown that convenience and ease of operation of the instrument and its accessories is a prime requisite to efficiency in modern observational work of a spectroscopic and astrophotographic character.

No changes have been made in the present observatory building or its equipment during the past year. As has already been stated, it is unsuited for any experimental or observational work. Even the rooms used for offices and library are becoming unsuitable for further occupancy.